

TITLE OF THE INVENTION

USED TONER COLLECTING APPARATUS OF A LASER PRINTER

CROSS-REFERENCE TO RELATED APPLICATIONS

[0001] This application claims the benefit under 35 U.S.C. §119(a) of Korean Patent Application No. 2003-44105 filed July 1, 2003, in the Korean Intellectual Property Office, the disclosure of which is incorporated herein by reference.

BACKGROUND OF THE INVENTION

1. Field of the Invention

[0002] The present invention relates to a used toner collecting apparatus of a laser printer.

2. Description of the Related Art

[0003] FIG. 1 shows a conventional laser printer. Referring to FIG. 1, the laser printer includes a corona unit 2, a charging unit 3, a laser scanning unit 4, developing units 5a, 5b, 5c, 5d to developing colors in the order of black K, yellow Y, magenta M, and cyan C, and a transferring belt 6. The respective parts are disposed along a rotating direction of a photosensitive drum 1 which is employed as a photosensitive medium.

[0004] A surface of the photosensitive drum 1 is evenly initialized to a predetermined voltage by the corona unit 2. The charging unit 3 charges the initialized surface of the photosensitive drum 1 to a predetermined electric potential. The laser-scanning unit 4 scans a laser beam selectively on the charged surface of the photosensitive drum 1 and forms an electrostatic latent image thereon in accordance with a desired image. The electrostatic latent image is developed to a desired color image as the developers 5a, 5b, 5c, 5d are overlain on one another. The color image on the surface of the photosensitive drum 1 is transferred to the transferring belt 6. Then the color image on the transferring belt 6 is transferred to a printing medium, which is delivered from a paper cassette 7 and passes between the transferring belt 6 and a backup

roller 8 rotating in contact with the transferring belt 6. The color image transferred to the printing medium is then fixed while passing through a fixing unit 9.

[0005] In the meanwhile, on each surface of the photosensitive drum 1 and the transferring belt 6, there is some used toner that is left after the toner is transferred onto the transferring belt 6 or to the printing medium in the processes as described above. In order to remove the remaining used toner, used toner cleaning units 10, 12 are disposed at each one of the photosensitive drum 1 and the transferring belt 6.

[0006] In each one of the cleaning units 10,12, the used toner removed from the photosensitive drum 1 or the transferring belt 6 is collected in a used toner collecting container along a predetermined way.

[0007] FIG. 2 shows a drawing of Japanese patent laid-open No. H11-202710 as one example of conventional used toner collecting apparatuses for collecting used toner from the photosensitive drum after developing process.

[0008] Referring to FIG. 2, used toner that is removed from the photosensitive drum (not shown) by a predetermined cleaning means (not shown) is transported to a drop pipe 16 that is disposed at one end of a transporting pipe 14 by an auger 15 which is set up in the transporting pipe 14. The drop pipe 16 is connected to an inlet 18a of a collecting container 18 that admits the used toner as the used toner drops from the drop pipe 16. The collecting container 18 includes a scattering member 19 disposed inside the collecting container 18 in a predetermined pose to disperse the dropping used toner evenly in the collecting container 18. In practice, the used toner, dropping from the inlet 18a, collides with the scattering member 19, and is dispersed evenly in the collecting container 18.

[0009] However, in the conventional used toner collecting apparatus as described above, the used toner occasionally lumps together because the used toner is pushed and moved in one direction by the auger 15 in the transporting pipe 14. A lump of used toner is not shattered even though it crashes against the scattering member 19 and drops as a lump into the collecting container 18. In this case, the collecting container 18 cannot admit the used toner efficiently because the used toner does not scatter evenly in the collecting container 18.

[0010] Also, the collecting container 18 may be is designed in various shapes in accordance with a size or a model of a laser printer. When a collecting container has a wide bottom, there is a problem that the used toner is hard to pile up evenly on the collecting container bottom if the lumped used toner is not broken finely.

SUMMARY OF THE INVENTION

[0011] Therefore, an aspect of the present invention provides a used toner collecting apparatus having a structure capable of breaking a lump of used toner and collecting the used toner after the used toner is broken.

[0012] According to the present invention, a used toner collecting apparatus for a laser printer, which collects the used toner transported from a cleaner to remove the used toner left after being developed in a body of the laser printer, comprises a collecting container at the body and having a used toner inlet through which the used toner transported from the cleaner unit comes, and a shattering member inside the collecting container having a breaking blade to break the used toner that comes and drops through the used toner inlet.

[0013] In an embodiment of the invention, the shattering member comprises a first slant and a second slant being respectively at obtuse angles to a dropping direction of the used toner dropped from the used toner inlet.

[0014] Also, in an embodiment of the invention, the breaking blade is disposed at boundary between the first slant and second slant in parallel with the dropping direction of the used toner.

[0015] Also, in an embodiment of the invention, the breaking blade is disposed just below the used toner inlet.

[0016] Also, in an embodiment of the invention, the shattering member is attached at a wall of the collecting container formed the used toner inlet.

[0017] Also, in an embodiment of the invention, the breaking blade comprises a first blade face in parallel with the dropping direction of the used toner, and a second blade face having a predetermined slope with the dropping direction of the used toner.

[0018] In another aspect of the present invention, a used toner collecting apparatus of a laser printer, which collects the used toner transported from a first cleaner to remove the used toner left on a transferring medium that transfers an image transferred from a photosensitive medium to a printing medium and a second cleaner to remove the used toner left on the photosensitive medium, comprises a collecting container having a first used toner inlet through which the used toner, transported from the first cleaner, comes and a second used toner inlet, through which the used toner transported from the second cleaner comes, and a shattering member disposed under at least one of the used toner inlets inside the collecting container, having a breaking blade to break the used toner that drops from the corresponding used toner inlet.

[0019] In an embodiment of the invention, the collecting container comprises a first space portion admitting the used toner come from the first used toner inlet and a second space portion admitting the used toner come from the second used toner inlet, and the shattering member is disposed at bigger one of the first space portion and the second space portion.

[0020] Also, in an embodiment of the invention, the first space portion is wider right and left of a dropping direction of the used toner than the second space portion, and the shattering member is disposed just below the first used toner inlet of the first space portion.

[0021] Also, in an embodiment of the invention, the shattering member comprises a first slant being at obtuse angles to the dropping direction of the used toner for guiding the used toner dropped from the first used toner inlet to one side of the dropping direction, and a second slant being at obtuse angles to the dropping direction of the used toner for guiding the used toner dropped from the first used toner inlet to the other side of the dropping direction, and the breaking blade is disposed at a boundary between the first slant and second slant just below the first used toner inlet.

[0022] Additional aspects and/or advantages of the invention will be set forth in part in the description which follows and, in part, will be obvious from the description, or may be learned by practice of the invention.

BRIEF DESCRIPTION OF THE DRAWINGS

[0023] The above objects and other features of the present invention will become more apparent by describing in detail a preferred embodiment thereof with reference to the attached drawings, in which:

FIG. 1 is a sectional view illustrating a structure of a conventional laser printer;

FIG. 2 is a sectional view illustrating a conventional used toner collecting apparatus;

FIG. 3 is a side view illustrating a used toner collecting apparatus according to an embodiment of the present invention;

FIG. 4 is a perspective view illustrating the used toner collecting apparatus and its peripheral components of FIG. 3;

FIG. 5 is a sectional view illustrating a principal part of FIG. 4;

FIG. 6 is a perspective view illustrating the used toner collecting apparatus of FIG. 3;

FIG. 7 is an enlarged view illustrating a principal part of a shattering member of FIG. 6;
and

FIG. 8 and FIG. 9 are sectional views for explaining an operation of the used toner collecting apparatus according to FIGS. 3 and 6.

DETAILED DESCRIPTION OF THE PREFERRED EMBODIMENTS

[0024] Reference will now be made in detail to the embodiments of the present invention, examples of which are illustrated in the accompanying drawings, wherein like reference numerals refer to the like elements throughout. The embodiments are described below to explain the present invention by referring to the figures.

[0025] Hereinafter, an embodiment of the present invention will be described in detail with reference to the accompanying drawings.

[0026] A used toner collecting apparatus of a laser printer, according to an embodiment of the present invention, is a device to collect the used toner having been transported from a cleaner, which removes toner remaining on a photosensitive drum or on a transferring belt after image developing. Here, before explaining the used toner collecting apparatus according to an embodiment of the present invention, a structure of a laser printer having cleaners and the used

toner collecting apparatus therein according to an embodiment of the present invention will be described.

[0027] The laser printer illustrated in FIG. 3 has a similar construction as that of the conventional laser printer explained by referring to FIG. 1. Therefore, throughout the description, the like elements having the same construction and function as those of the conventional laser printer as described above with reference to FIG. 1 will be referred to by the same reference numerals. The K, Y, M, C developers (5a, 5b, 5c, 5d: see FIG. 1) are arranged in order in a direction of rotation of the photosensitive drum 1. Also, a transferring belt 6 is disposed to travel in contact with the photosensitive drum 1. An image developed on a surface of the photosensitive drum 1 by each one of the above developers is transferred to the transferring belt 6. The transferring belt 6 has a first cleaner 10 to remove the used toner from the surface of the transferring belt 6 after the image is transferred to a printing medium.

[0028] The first cleaner 10 comprises a cleaning blade 21 to contact the transferring belt 6, an auger 23 (see FIG. 4) to collect the used toner removed by the cleaning blade 21 in one side, and a conveying duct 25 to guide the used toner collected in one side by the auger 23 to a collecting container 40 described below. By rotating, the auger 23 pushes and transports the used toner, removed by the cleaning blade 21, toward the conveying duct 25. Referring to FIG. 5, the conveying duct 25 has an inclined plane 25a inside thereof. The used toner collected by the auger 23 falls down along the inclined plane 25a, and is discharged through an outlet 25b at a low portion of the conveying duct 25. The first cleaner 10 described above has a similar structure as the conventional cleaner, and therefore, further explanation is omitted.

[0029] Also, the photosensitive drum 1 has a second cleaner 12 to remove the remaining used toner from the surface of the photosensitive drum 1 after toner is transferred onto the transferring belt 6. The second cleaner 12 comprises a cleaning blade 31 to contact the photosensitive drum 1, an auger 33 to transport the removed used toner to one side, a housing 35 to collect the used toner which is transported to one side by the auger 33, a conveying pipe 37 to transport the used toner collected in the housing 35 to a predetermined position, and a used toner discharge duct 39 at the upper portion of the conveying pipe 37. The used toner discharge duct 39 is disposed above the housing 35 in predetermined height, and is capable of dropping the used toner through the used toner inlet 40b formed at the upper portion of the collecting container 40. Accordingly, the collecting container 40 collects the used toner in as

much quantity as possible, while preventing the used toner inlet 40b from clogging. The housing 35 has a toner drop 35a in its upper portion, and the used toner transported by the auger 33 drops into the housing 35 through the toner drop 35a. Inside the conveying pipe 37, there is a pump to drive the used toner up to the discharge duct 39. As an example, a flexible auger may serve as the pump. The discharge duct 39 is similar to the structure of the conveying duct 25. Thus, the discharge duct 39 has an inclined plane (not shown) in its inside, and allows the used toner, pumped from the housing 35, fall down through a discharge hole 39a.

[0030] In the structure described above, a used toner collecting apparatus according to an embodiment of the present invention comprises a collecting container 40 collecting the used toner removed and transported by each one of the cleaning units 10, 12 and a shattering member 50 disposed at inside of the collecting container 40.

[0031] Referring to FIG. 6, the collecting container 40 is vertically disposed in front of the photosensitive drum 1, and has a first used toner inlet 40a and a second used toner inlet 40b. The first and second used toner inlets 40a, 40b are formed in the same height in upper portions of the collecting container 40. The first used toner inlet 40a is formed to collect the used toner, which is removed by the first cleaner 10 and the second used toner inlet 40b is formed to collect the used toner removed by the second cleaner 12.

[0032] The collecting container 40 comprises a rear wall 41 in which the first and second used toner inlets 40a, 40b are formed, and a front wall 43 formed in front of the rear wall 41. A first space portion 45a and a second space portion 45b are formed between the rear wall 41 and the front wall 43. The used toner enters through each one of the first and second used toner inlets 40a, 40b and is admitted in each one of the first and second space portions 45a, 45b. In detail, the first space portion 45a has a width which is greater than a height of the first space portion 45a, and the second space portion 45b has a height, which is greater than a width of the second space portion 45b. The used toner coming in through the first used toner inlet 40a is admitted in the first space portion 45a and the used toner coming in through the second used toner inlet 40b is admitted in the second space portion 45b. The first and second space portions 45a, 45b fluidly communicate with each other.

[0033] Referring to FIG. 6 and FIG. 7, the shattering member 50 is disposed inside the collecting container 40. The shattering member 50 shatters the used toner which drops into the collecting container 40 through the first used toner inlet 40a, and spreads the shattered used toner evenly throughout the first and second space portions 45a, 45b. Because the first space portion 45a has a wider space in a horizontal direction, the shattering member 50 allows the used toner to spread evenly from side to side. To achieve this, the shattering member 50 has a first slant 51 and a second slant 53, which are placed at obtuse angles θ_1 , θ_2 to a dropping direction A of the used toner, and a breaking blade 55 which is disposed at a border between the first slant 51 and the second slant 53.

[0034] The first slant 51 is longer than the second slant 53 according to a structure of the first space portion 45a. The lower portions of the first and second slants 51, 53 are at a predetermined distance from a bottom of the first space portion 45a.

[0035] The breaking blade 55 is disposed just below the first used toner inlet 40a, and breaks lumps of the used toner falling to the dropping direction A. As shown in FIG. 7, the breaking blade 55 has a first blade face 55a that is parallel to the dropping direction A and a second blade face 55b that is placed at obtuse angle θ_3 to the dropping direction A.

[0036] Accordingly, as shown in FIG. 8, a lump of used toner T that drops in a dropping direction A contacts a point of the breaking blade 55c and is broken into pieces, T1 and T2. Next, the lump of used toner, T1 which was a part of toner T, rolls toward the first blade face 55a among other lumps of used toner, also broken by the breaking blade 55, and contacts a slanted face 51a of the first slant 51. Some small lumps of used toner, broken by the first blade face 55a, bounce and splatter into the first space portion 45a, and others roll along the slant face 51a and pile up into a left side of the first space portion 45a.

[0037] Meanwhile, the lump of used toner T2 rolls toward the second blade face 55b, counterbalances with the slope of the second blade face 55b, and rolls down, or slides down along a slant face 53a of the second slant 53. Therefore, the left lump of used toner T1 is broken more finely and spreads more evenly than the right lump T2. The right lump of used toner T2 is broken in a relatively bigger lump, and is piled up in the right side of the first space portion 45a. As described above, breaking and spreading ranges of used toner can be controlled by adjusting the angles of the both blade faces 55a, 55b of the breaking blade 55.

When the first space portion 45a has a bigger space in a left side of the first used toner inlet 40a than in a right side, used toner can be broken more finely and spread more evenly in the left side of the first space portion by controlling the angles of the both blade faces 55a, 55b of the breaking blade 55.

[0038] In an embodiment of the invention, the breaking blade 55 having a function as described above is formed as one body with the first slant 51 and second slant 53, and also with the rear wall 41.

[0039] Also, as shown in FIG. 9, a width of the shattering member 50 having the breaking blade 55 is narrower than a gap between the rear wall 41 and the front wall 43. Therefore, the used toner is piled up evenly just below the shattering member 50, because the used toner broken by the shattering member 50 drops down between the shattering member 50 and the front wall 43.

[0040] According to the present invention as described above, the used toner collecting apparatus of the laser printer enables the lump of used toner that is removed by the cleaning unit and collected to the collecting container to effectively break and to spread evenly in the collecting container.

[0041] As a result, a term of use of the collecting container can be lengthened because the collecting apparatus according to the present invention uses the space of the collecting container at full stretch for collecting used toner.

[0042] Although a few embodiments of the present invention have been shown and described, it would be appreciated by those skilled in the art that changes may be made in this embodiment without departing from the principles and spirit of the invention, the scope of which is defined in the claims and their equivalents.